

**ANTITHAMNION PILIFERUM SP. NOV.**  
**(CERAMIACEAE, RHODOPHYTA)**  
**FROM EASTERN SICILY (MEDITERRANEAN SEA)**

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**ABSTRACT.** — In this paper the authors describe a new species of the genus *Antithamnion* Naegeli, *A. piliferum* sp. nov., from the Eastern coast of Sicily (Mediterranean Sea). It shows creeping filaments from which erect filaments arise. The erect filaments bear opposite branchlets decussately arranged. The branchlets are alternately ramified bearing pinnae and pinnules of secondary order. The gland cells are always placed on two-celled branches (pinnae or pinnules). All the terminal cells are provided with two (rarely one) long hyaline hairs. A comparison with related species of *Antithamnion* was carried out. Reproduction unknown. A key to *Antithamnion* species from the Mediterranean is proposed.

**RÉSUMÉ.** — Les auteurs décrivent une nouvelle Céramiacée récoltée sur la côte orientale de la Sicile (Mer Méditerranée) appartenant au genre *Antithamnion* : *A. piliferum* sp. nov. Le thalle possède des filaments rampants d'où s'élèvent des axes dressés portant des pleuridies opposées et décussées. Les pleuridies présentent des ramules disposés alternativement et eux-mêmes porteurs de pinnules. Les cellules sécrétrices se localisent sur des ramules ou des pinnules bicellulaires. Les cellules terminales sont prolongées par deux longs poils hyalins, plus rarement un seul. Les caractères de la nouvelle espèce sont comparés avec ceux des espèces affines. Les individus fertiles sont inconnus. Une clé de détermination des *Antithamnion* méditerranéen est proposée à la fin du travail.

**KEY WORDS :** *Antithamnion piliferum* sp. nov., Ceramiaceae, Sicily, Mediterranean Sea.

### INTRODUCTION

The genus *Antithamnion* Naegeli 1847 is represented in the Mediterranean Sea by *A. cladodermum* (Zanardini) Hauck<sup>1</sup>, *A. cruciatum* (C. Agardh) Naegeli, *A. heterocladum* Funk, *A. tenuissimum* (Hauck) Schiffner (G. FELDMANN-

[1] This species has probably to be referred to the genus *Baltheila* Itono et Tanaka. Nevertheless, because sexual structures are yet unknown, the nomenclatural recombination has not been made (HUISMAN et KRAFT, 1984; ATHANASIADIS, 1985).

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MAZOYER, 1940; BOUDOURESQUE, 1984; GIACCONE et al., 1985), *A. antillanum* Boergesen (SCHIFFNER, 1931 (doubtful record); BOUDOURESQUE et VERLAQUE, 1976), and *A. ogdeniae* Abbott (ATHANASIADIS, 1985).

During the research on marine benthic flora and vegetation of the Eastern coast of Sicily, a species of Ceramiaceae belonging to the genus *Antithamnion* Naegeli was collected.

In spite of the lack of fertile specimens, vegetative features of this taxon are sufficient to recognize it as a new species.

### MATERIAL AND METHODS

All the thalli were hand-collected using SCUBA at Capo Passero (Syracuse, Italy) (see map) at 18 m depth epiphytic on *Posidonia oceanica* (L.) Delile leaves. All the observations were made on fluid preserved material. Material preserved in buffered 3% formalin in sea water was used for preparation of microscope slides. Iodine-Potassium iodide was used as temporary stain for photograph.



Map of Sicily showing the type locality of *Antithamnion piliferum* sp. nov.

Herbarium specimens (holo- and isotypes) are held at the Botanical Institute of University of Catania.

## OBSERVATIONS

*Antithamnion piliferum* sp. nov.

*Diagnosis* : plantae epiphyticae, ecorticatae; axibus repentibus substrato adfixis rhizoideis pluricellularibus disco terminali praeditis. Axibus erectis, 2.4 mm altis, ramulis oppositis decussatisque instructis. Ramulis alternatim ramosis; pinnis uni- multicellularibus. Pinnae multicellulares 1-3 pinnulas, unicellulares, in exteriore latere gerentes. Pinnae bicellulares atque pinnulae bicellulares proximales, singula cellula glandulosa, in ambabus cellulis insistenti, ventraliter instructae. Pinnae et pinnulae glanduliferae cellula basali longiori quam ea apicali, 2-3 plo in pinnis, 1-1.5 plo in pinnulis. Omnibus cellulis terminalibus 2(1) hyalinis pilis, ad 200  $\mu$ m longis, praeditis. Reproductione ignota.

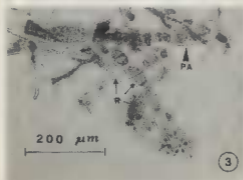
Plants epiphytic, unicorticated; with creeping filaments fastened to the substratum by means of many-celled rhizoids ending in a disc. The erect filaments, 2 mm (in thalli with axial cells measuring 170 x 50  $\mu$ m) up to 4 mm tall (in thalli with axial cells measuring 250 x 25  $\mu$ m), bear opposite branchlets decussately arranged. These branchlets (250-370  $\mu$ m long) are alternately ramified, bearing one to many-celled pinnae. The many-celled pinnae are provided with one to three pinnules, each of one or two cells, growing on the abaxial side. The two-celled pinnae and the proximal two-celled pinnules, carry on the adaxial side a gland cell which rests on both of them. Pinnae and gland-bearing pinnules show the basal cell longer than the apical one (2 to 3 times in pinnae, 1 to 1.5 times in pinnules). All the terminal cells are provided with 2(1) hyaline hairs each to 200  $\mu$ m long. Reproduction unknown. Named on account of the presence of hairs.

Type locality : Capo Passero (Syracuse, Italy), epiphytic on *Posidonia oceanica* (L.) Delile leaves at 18 m depth.

Holotype : CAT 490 sterile; collected by M. Cormaci and G. Furnari, 11 June 1983.

Distribution : known from the type locality at 18 m depth. Also collected, in the same locality, at 10 and 25 m depth in June 1983 and at 15 m depth in November 1984.

The thalli (Figs. 1, 2) consist of a prostrate system from which erect filaments arise. Decumbent filaments are fastened to the substratum (*Posidonia oceanica* leaves) by means of multicellular rhizoids ending in an adhesive disc (Fig. 3). Erect branches bear pairs of opposite branchlets decussately arranged (Fig. 4). The basal cells of the branchlets are characteristically smaller than the other ones, and nearly quadrate in form. From these cells lateral branches adventitiously originate and, in the lowermost parts of the thallus, the rhizoids too (Fig. 5). The branchlets are alternately ramified with one- or many-celled pinnae. From the many-celled ones, 1-3 pinnules one- or two-celled, generally issue unilaterally from the abaxial side (Fig. 6). Both the two-celled pinnae and the two-celled pinnules have the basal cell longer than the apical one (2-3 times in the pinnae,



1-1.5 times in the pinnules). They also bear on the adaxial side one gland cell which rests on both of them (Figs. 7, 8). Terminal cells are provided with two, rarely one, long hyaline hairs (Fig. 9).

### REMARKS

*Antithamnion piliferum*, even though lacking reproductive organs, belongs, undoubtedly, to the genus *Antithamnion* on the basis of the following features: (sub-)equal whorl-branchlets, that initiate in a regular sequence, arranged in opposite pairs and each with a small basal cell, quadrate in form and gland cells borne on special two-celled branches. These vegetative characters are typical of the genus *Antithamnion* as defined by WOLLASTON (1968, 1971, 1972).

From the pattern of branching *A. piliferum* appears to be related to both *A. ogdeniae* and *A. antillanum* Boergesen as described by BOERGESSEN (1930) on the basis of the specimens from the Canary Islands<sup>1</sup>. Specimens from the Antilles, in fact, showed branching of erect axes which was opposite but not decussate (BOERGESSEN, 1917) and unequal-dimorphic whorl branchlets (ATHANASIADIS, 1985).

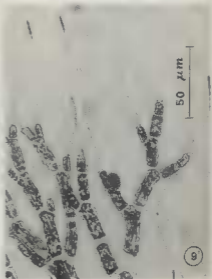
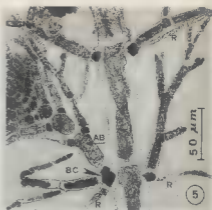
A pattern of branching similar to *A. piliferum*, is also showed by both *A. therminieri* Nasr and BOERGESSEN's *Antithamnion* sp. (BOERGESSEN, 1917: 229-230). But the former, as pointed out by ATHANASIADIS (1985), bears unequal-dimorphic whorl branchlets (this feature led ATHANASIADIS to consider it conspecific with *A. antillanum*), and the latter, unlike *A. piliferum*, has a quite extended prostrate system and no gland cells.

*A. piliferum* differs from the above mentioned species in the whorl branchlets that are quite short with a rachis of few cells (up to 10). This character is also showed by *A. diminuatum* Wollaston that, however, bears 1-3 opposite pairs of pinnae at the lower parts of whorl branchlets (WOLLASTON, 1968; 1984, under *Antithamnion* sp.) as also *A. ogdeniae* occasionally does (ATHANASIADIS, 1985). Such pairs of pinnae are never showed by *A. piliferum*.

Moreover in *A. therminieri*, *A. antillanum* and *A. ogdeniae* the unramified pinnae as well as numerous pinnules, are many-celled; while in *A. piliferum* they are one- or two-celled and the two-celled ones, which bear the gland cell, show, as above mentioned, the basal cell to be longer than the apical one. The gland cells in *A. piliferum* are scattered on the thallus and always borne on two-celled

(1) These specimens, according to ATHANASIADIS (1985) have to be referred to *A. ogdeniae*.

Figs. 1-3 - *Antithamnion piliferum* sp. nov. Fig. 1: Habit of a specimen with shorter cells. Fig. 2: Habit of a specimen with longer cells. Fig. 3: Rhizoids (R) from a reduced prostrate axis (PA).



branches (pinnae and pinnules with the above mentioned characteristics). On the contrary, in *A. ogdeniae* gland cell branches consist of two or three cells (ABBOTT, 1979; ATHANASIADIS, 1985); in *A. diminutum* of two to four (-five) cells (WOLLASTON, 1968; 1984, under *Antithamnion* sp.); in *A. antillanum* of two to four (rarely more) cells (BOERGESEN, 1917; ITONO, 1969 (as *A. lherminieri*), 1977; BOUDOURESQUE et VERLAQUE, 1976<sup>1</sup>; ABBOTT, 1979; WOLLASTON, 1984), and in *A. lherminieri* of two to six cells (NASR, 1941) or rarely of more than ten cells (ABBOTT, 1979).

Finally, the occurrence of hyaline hairs in the genus *Antithamnion*, is very rare. *A. cruciatum*, the type species of the genus, does not show any, either in the cells bearing carpogonial branches (L'HARDY-HALOS, 1968) unlike the related genus *Antithamnionella* Lyle does (L'HARDY-HALOS, 1968, Fig. 9D; 1985, Figs 27 and 41). Only in *A. cruciatum* var. *profundum* G. Feldmann-Mazoyer, L'HARDY-HALOS (1968 Fig. 14F) depicts a hyaline hair but it seems almost occasional. Terminal hair cells were observed in culture plants (female gametophytes) of *A. heterocladum* Funk (ATHANASIADIS, 1983) and in field specimens of Boergesen's *Antithamnion* sp. (BOERGESEN, 1917 : 229-230), but in both these taxa they were borne only singly.

Therefore, as far as we know, *A. piliferum* is the only species of *Antithamnion* in which pairs of terminal hairs (the functional significance of which is at present unknown) regularly occur.

Vegetative features of *A. piliferum* can be summarized as follows :

- whorl branchlets opposite and decussately arranged
- (sub-)equal whorl branchlets short (up to 10 cells)
- no pairs of opposite pinnae on whorl branchlets
- gland cells placed only on two-celled branches which have the basal cell longer than the apical one
- terminal cells provided with pairs of hyaline hairs.

1. On the basis of ATHANASIADIS' (1985) remarks, specimens from Corsica have probably to be referred to *A. ogdeniae*.

Fig. 4-9. - *Antithamnion piliferum* sp. nov. Fig. 4 : Detail of branching of an erect axis. The whorl-branchlets are opposite and decussately arranged. Fig. 5 : The lowermost part of an erect axis. Origin of rhizoids (R) and of an adventitious branch (AB). (BC) Basal cell of the branchlet. Fig. 6 : Branchlet bearing pinnae (P) with pinnules (p). Fig. 7 : Gland cell resting on a two-celled pinnule. Fig. 8 : Gland cell resting on a two-celled pinna. Fig. 9 : Detail of terminal hyaline hairs.

Key to the Mediterranean species, varieties and formae  
of *Antithamnion* based on vegetative features

- 1a Unequal-dimorphic whorl-branchlets. Gland cells or not . . . . . 2
- 1b Equal or sub-equal whorl-branchlets opposite and decussately arranged.  
Gland cells or not . . . . . 3
- 2a No gland cells . . . . . *A. heterocladum* Funk
- 2b Gland cells on specialized branches of 2-4 (rarely more) cells . . . . .  
. . . . . *A. antillanum* Boergesen<sup>1</sup>
- 3a No gland cells . . . . . *A. tenuissimum* (Hauck) Schiffner
- 3b Gland cells on specialized branches . . . . . 4
- 4a Whorl-branchlets alternately ramified . . . . . 5
- 4b Whorl-branchlets oppositely or unilaterally (also alternately in var. *profundum*)  
ramified . . . . . 6
- 5a Terminal cells provided with pairs of hyaline hairs. Whorl-branchlets short  
up to 10 cells. Gland cells on 2-celled branches which show the basal cell  
usually longer . . . . . *A. piliferum* sp. nov.
- 5b No such terminal pairs of hyaline hairs. Whorl-branchlets long up to 17 cells.  
Occasionally pairs of opposite pinnae at the lower part of whorl-branchlets.  
Gland cells on 2-3 celled branches . . . . . *A. ogdeniae* Abbott
- 6a Pinnae unilateral and/or opposite; if opposite then generally unequal. Cells  
1-5 times longer than broad . . . . . 7
- 6b Pinnae mostly unilateral or alternate, rarely opposite. Cells 5-7 times longer  
than broad . . . . . *A. cruciatum* (C. Agardh) Naegeli  
. . . . . var. *profundum* G. Feldmann-Mazoyer
- a) Only erect axes . . . . . f. *profundum*
- b) Axes mostly prostrate . . . . . f. *radicans* G. Feldmann-Mazoyer
- 7a Cells 1-2 times longer than broad . . . . . *A. cruciatum* (C. Agardh) Naegeli  
. . . . . var. *pumilum* (Harvey) L'Hardy-Halos<sup>2</sup>
- 7b Cells 3-5 times longer than broad . . . . .  
. . . . . *A. cruciatum* (C. Agardh) Naegeli var. *cruciatum*
- a) Only erect axes . . . . . f. *cruciatum*
- b) Axes mostly prostrate . . . . . f. *radicans* (J. Agardh) Collins et Hervey

Three more taxa are reported from the Mediterranean Sea, but their validity and/or taxonomic rank appear doubtful. They are: *A. cruciatum* var. *comosum* Schiffner, *A. cruciatum* var. *comosum* f. *moniliatum* Schiffner and *A. cruciatum* f. *fragilissimum* (Zanardini) Hauck. The first two taxa are reported only by SCHIFFNER (1926) respectively from Gulf of Naples and Capodistria. Schiffner's descriptions are poor: neither iconography, nor informations on whorl branchlets branching are given. So, they don't appear well characterized and their validity remains doubtful. *A. cruciatum* f. *fragilissimum* is reported from

1. Mediterranean reports of this species have probably to be referred to *A. ogdeniae*.

2. Reported from Catalan coast by BALLESTEROS et ROMERO (1982).



the Adriatic Sea by ZANARDINI (1860, as *Callithamnion fragilissimum* Zanardini), HAUCK (1885), DE TONI (1903, as *A. fragilissimum* (Zanardini) De Toni), PREDA (1908), PIGNATTI (1962); from the Aegean Sea by GERLOFF and GEISSLER (1971), HARITONIDIS and TSEKOS (1974, 1976). The examination of Zanardini's specimens (in *exsiccata*) held in Museo Civico Storia Naturale of Venice, did not permit to observe either thallus structure, or if there were, any gland cells which, on the other hand, aren't mentioned in the description neither are showed in the iconography. Therefore, the taxonomic rank of this taxon remains doubtful. In fact, if it had gland cells like *A. cruciatum*, then it could be considered, according to HAUCK (1885), as a form with whorl branchlets regularly alternately ramified. On the contrary, if gland cells were not arranged as in *A. cruciatum* or were completely lacking, then it could be treated as a species.

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